

## SMUD Thoughts On ZENH

### Background

Since 2001, SMUD has worked with nine area builders to introduce PV roofing tiles in the residential new construction market. Examples include the Beazer PowerHouse, which incorporated a 3.3 kW PV system along with several energy efficiency measures to substantially reduce electricity use. More recently, SMUD has been working with the DOE as part of the Zero Energy Home (ZEH) Program. The goal is to reduce energy costs by 60% for homeowners in the near-term, and fully 100% in the long-term (i.e. true zero net energy homes). Our current project with Premier Homes will incorporate a 2kW BIPV system and other energy efficiency equipment as standard features on all 95 homes in their Premier Gardens development. As part of this project, SMUD will be monitoring the distribution system to quantify the benefits PV can offer to utility infrastructure costs. This is the second ZEH project in SMUD's service territory, and a third will be initiated in 2005.

### Issues

There are some key hurdles that have limited PV diffusion into the residential new construction market. The fundamental "chicken and egg" issue can be described as:

- Before investing in new products/plant (roof-integrated PV) and staffing for sales and training support, PV manufacturers want to see certainty in the marketplace including:
  - Orders
  - Incentives (to enable these orders)

Without these investments, acceptable costs will be difficult to achieve.

- Before investing in new products, builders want to hedge their risks in the marketplace including:
  - Knowing that the product has market appeal
  - Knowing that the product adds value to their homes
  - Knowing that the product will perform as promised
  - Knowing that the product will not lead to future service/liability issues
  - Knowing that the product is competitively priced and readily available
  - Knowing that the manufacturers support their product in the field and in the sales office

Based on our program experience, it is SMUD's opinion that:

- For PV to be cost effective, the home must be as energy efficient as possible (this minimizes the PV system size needed to achieve energy goals).
- Residential new construction is the most cost effective way to install PV due to:

- Volume purchasing
- Standardized system design
- Lowest cost installation
- Builders are the masters of cutting costs
- Highest growth potential
- Builders/buyers like the concept of a ZENH.
- Builders/buyers prefer roof integrated PV products due to aesthetics, but lack awareness of PV's benefits.
- Builders prefer to use their own subcontractors (roofers and electricians) to install product and prefer that PV be delivered through their existing supply chain, however builders and their subs are not experienced with PV.
- kWh, kW and distribution system savings have not been adequately documented – this is a key savings that must be demonstrated to utilities.
- Energy features (including PV) have the greatest chance of success if they are standard features in the home (as opposed to options that can be added on during the purchase transaction).

### ZENH Opportunities

The CEC may wish to consider the progress to date under the DOE's ZEH program. Many of the research targets identified by PIER for Zero Energy New Homes are being pursued, and a partnership between the CEC and DOE could dramatically leverage the combined resources. Benefits of a partnership include:

- Builds on existing efforts:
  - Widespread publicity in builder industry
  - Existing relationships w/ builders
  - Utility support
- Avoids duplication of efforts.
- Provides empirical data on current and next-generation California homes and their supporting distribution systems.
- Successful partnerships with manufacturers, builders, and utilities in place.

### Research Needs

The following research areas are suggested:

- Demonstrate the technologies needed to get from the 60% energy savings currently targeted by the DOE's ZEH program to the long-term goal of 100%.
- Demonstrate, more specifically, peak reduction technologies (such as building construction and active load control/energy management).
- Demonstrate competitive roof-integrated products to provide alternatives to builders and stimulate cost reduction among manufacturers.
- Demonstrate and quantify the benefits to local distribution systems through voltage support and reduced infrastructure needs.
- Develop/demonstrate methods to increase buyer awareness of PV and the value it provides.

- Develop/demonstrate performance based incentives (or specific PV rates) that support introduction of PV into the marketplace.

### Suggested Alternative

Given the above research needs and collaboration opportunity, it is suggested that an alternative to an RFP be considered. This alternative would be a structured demonstration project with participation in key growth areas across California. A collaborative effort is proposed between the CEC, DOE, BIA, and the interconnecting utilities to sponsor and support ZENH projects with leading home builders (top 10) in key markets – East Bay, Central Valley, Inland Empire, High Desert, San Diego, Orange County, and the Sacramento area. The project would fund 10 zero energy home development projects comprised of 100 homes each (1000 homes total).

This effort would address the research needs identified above, while simultaneously kick-starting the introduction of ZENH developments across the state. Other benefits include:

- Accelerated results:
  - Builders are planning their 2005 product releases, and an RFP may delay the opportunity until 2006
  - Provides empirical data on real homes, real energy use, and actual achieved savings
- Provides market certainty to PV manufacturers to develop roof integrated products and supporting infrastructure, and an opportunity to work out field issues and develop marketing strategies.
- Hedges builders' risks:
  - Collaborative effort marketed under national and state government and utility program banner
  - High volume should assure builders lowest possible product cost
  - Builders/subcontractors get to "test" different products and create positive feedback loops that lead to improvements in products and installation
- Encourages multiple manufacturers to enter market and fosters competition.
- Creates market buzz that builders/others can't ignore.
- Provides test cases to research key issues, including:
  - KWh, kW and infrastructure savings impacts of community scale ZENH on local utility systems, especially high-growth areas that are driving state's peak demand and/or areas with transmission congestion (e.g. San Diego)
  - Provides data to develop performance based incentives (rates) based on real world data (e.g. local insolation and utility conditions)
  - Gathers market data on buyer preferences and attitudes
- Takes advantage of interagency agreement mechanisms with other publicly funded organizations.
- Addresses other efficiency issues (such as natural gas use)